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AND

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State Prison Labor.

[From the Buffalo Whig.]

Since the Mechanics' Convention, upon the subject of our States' Prison labor, some notice of the facts, it seems, is deemed advisable by "the powers that be." Printed circulars have been despatched by the keeper of the Auburn Prison, of which a copy follows below. Several have been received in this city, and they have probably gone to all parts of the State. The circular follows:

State Prison, Auburn, August, 1834.

DEAR SIR,—You are doubtless aware that latterly considerable excitement has existed in many parts of the State, relative to the employment of convicts in mechanical labor in the State Prisons. Feeling deeply the importance of the subject, as connected with our penitentiary institutions, and anxious to learn as far as possible the effect which that labor has upon the citizen mechanic's interests, as well as the effects of our prison system upon our discharged convicts, allow me to solicit your answers to the following interrogatories:

1st. Are you acquainted with any persons who have been discharged from either of the State Prisons? and if sc, what are their names, places of residence, and what has been their conduct, habits, and character, since their discharge; also before conviction, if known?

2d. What branches of mechanical or other business do they prosecute, and to what extent?

3d. Are there any articles manufactured in the prisons of the State sold in your place? and if so, what kinds, and to what amount per annum?

4th. Does the mechanical business of the prisons injuriously affect the interests of the mechanics of your place? and if so, is it in the price or the quantity brought into your market, or any other cause?

The information above sought, is not merely important to the State, but to the United States, as well as to European nations, inasmuch as it involves the permanency of a system of prison discipline, which has been considered the best extant, and which, in truth, has constituted a new era in the punishment and reformation of criminals in this country, and is now receiving the attention of the governments of Europe.

I therefore trust the subject will be considered of sufficient importance to claim your early and serious attention.

I am, with great respect, your obedient servant,

LEVI LEWIS,
Agent and Keeper.

To —— ———, Buffalo, Erie Co.

The following answers to the third and fourth interrogatories were prepared by one of our mechanics, to be forwarded to the keeper of the prison:

Answer to third interrogatory.

There are a number of articles sold in Buffalo which are manufactured in the prisons of this State, to wit: joiners' tools, saddlery of all kinds, both brass and plated, hames, saddle trees; copper ware, such as furniture for cook stoves, &c.; blacksmith work of various kinds, such as iron doors, grates, bars, bolts, locks, chains, and hinges; wooden ware, such as tubs, pails, churns, &c.; ready made clothing, and it is believed boots and shoes; combs, and several other articles, some of which are purchased in New-York, at second hand, without the purchaser's being aware of the articles being manufactured in the prisons.

The amount of articles sold in this city the last year, from the best data that can be obtained, exceeds fifteen thousand dollars—one house disposing of about one fourth part of this amount.

Answer to the fourth interrogatory.

The several mechanical branches with which the prison wares have come into competition are seriously injured, and it is said some establishments have been broken up in consequence, and that others must follow.

It is believed that the low price at which the prison wares are sold is the principal cause of complaint, it being on some articles but little above the price of the raw material.

The manufacture of some articles which are carried on pretty extensively, have, in consequence of the introduction of the same

kind of articles manufactured in the prisons, been entirely discontinued—an establishment for manufacturing hames, employing from 10 to 12 workmen in 1830, has been entirely abandoned.

Copper furniture for cooking stoves, manufactured in the prisons, was introduced into this city in 1833, and offered at prices considerably below what it cost to manufacture it. The consequence has been, that the prison ware is now extensively sold, and will, if this is persisted in, supersede all other. There are about six or eight establishments now in Buffalo for the manufacture of copper, tin, and sheet iron ware, employing about 50 workmen. The conductors of these establishments say it is impossible for them to compete with prison prices. The iron work for the new county prison, erected in 1832 and '3, was wrought at the Auburn Prison, consisting of doors, grates, locks, &c. &c. amounting to more than two thousand dollars.

Whether any answers to queries one and two have been returned we are not informed. We were recently acquainted with a very worthy mechanic in this city, now deceased, who, previously to his residence here, was employed in superintending the blacksmiths in the Auburn prison. That trade he followed here; and from his knowledge of the discipline of the prison, and the signs by which the prisoners (not being allowed to speak) call for what they need, he often detected those he had employed as graduates of the Auburn institution. He informed us that he detected in this way from fifteen to twenty of these, in the course of two years. Several of them proved most arrant knaves; and no one so demeaned himself as to retain his place longer than a few days. Some of them pilfered his small tools, and one broke open his shop at night and robbed it. A chairmaker, also at work here, plundered his employer and decamped, who was from the same school.

In short, reformation, we believe, can seldom be found to have resulted from our prison system.

The Central Committee of the Mechanics' Convention of the State of New-York addressed the following communication to the several candidates in nomination for Governor and Lieutenant Governor, at the recent election, and received the subjoined replies.

Utica, October 14, 1834.

Sir,—The Central Corresponding Committee of the State Convention of Mechanics have been instructed to request of the several candidates for Governor and Lieutenant Governor, their respective views on the subject of employing the convicts in our state prisons at mechanical labor, as at present conducted, and to communicate the same, when obtained, to the several county corresponding committees.

To enable the candidates more distinctly to understand the object of this inquiry, a copy of the proceedings of the State Convention of Mechanics is forwarded by mail to each.

Any communication you may think proper to make on the subject, addressed to the subscriber, in this place, will be duly communicated to the several corresponding committees.

An early compliance with the above request will be justly appreciated by the mechanics of this state.

By order of the State Central Committee of Correspondence,

Rudolph Snyder, Chairman.

Oxford, October 17, 1834.

Sir,—I have the honor to acknowledge the receipt of your letter of the 14th instant, written in behalf of the Central Corresponding Committee of the State Convention of Mechanics, requesting my views on the subject of employing the convicts in our state prisons at mechanical labor, as at present conducted.

I cheerfully comply with the request of the committee, and, in doing so, make known to you sentiments I have long entertained and expressed.

Believing that the mechanics of this state have reason to complain of the state prison system in regard to mechanical labor, as at present conducted, I think justice to them requires that the laws upon which that system is founded should be so altered as to remove the causes of complaint, and to prevent the injurious consequences resulting to that respectable and highly meritorious class of citizens.

I am, sir, very respectfully, yours,

John Tracy.

Mr. Rudolph Snyder, Chairman of the State Central Committee of Correspondence.

Auburn, October 17, 1834.

Sir,—It would have been much more agreeable to me not to appear before the public during the ardent if not angry discussions which precede the approaching election. I am aware to how much misconstruction and misrepresentation such a proceeding is exposed. I have abstained from the avowal of my sentiments upon various matters which have been heretofore the subject of discus-

sion, because my opinions on those subjects could be collected from public acts in the ordinary discharge of legislative duties. But the subject to which you invite my attention is one which no public opportunity has been hitherto afforded me to express my opinions. Still this consideration would not induce me to appear at this time before the public, if I did not feel compelled to that step by a principle of conduct which I have ever cherished and maintained. It cannot be denied that it is the right of every citizen to ask, and of every candidate for public office to give, an expression of his views upon any important question of public policy, in relation to which, if elected, he may be called upon to act officially. To deny this principle in an elective government, where the representative is to express the will of his constituents, would be to deny the principle on which the government itself rests.

I answer the communication you have addressed to me with the more pleasure, because it comes in such a shape as to be entitled to be regarded as the act of that enterprising and patriotic class of citizens of this state who are engaged in mechanical pursuits. I am required by the committee to express my views on the subject of employing convicts in our state prisons at mechanical labor as at present conducted. To this inquiry, I say explicitly, that there must be a radical error in any system which substitutes the labor of felons, the outcasts of society, for the industry of honest and enterprizing citizens, and which drives those citizens from the pursuit of their lawful and meritorious callings. Still, I am and ever have been a friend of the penitentiary system, in the place of sanguinary punishments. Without going more minutely into the details of the present system, than the occasion will warrant, it is proper to remark that the physical force of the convicts at Auburn, averaging at least six hundred for a number of years past, controlled and directed by the admirable police which prevails there, and aided by both steam and water power, has converted that prison into an immense manufacturing establishment, which might be expected to yield a revenue greater than all the manufactories in any town in the state; and yet the fact is, that prison yields a surplus revenue of only some $3000 or $4000 annually. It is evident, therefore, that the advantage to the state, even in a pecuniary point of view, bears no comparison to the enormous extent of the injury inflicted upon the interests of citizens engaged in manufacturing pursuits. The result unquestionably is, without its having been anticipated by the benevolent founders of the penitentiary system, that the state prisons have been converted into a monopoly of the mechanical business, ruinous to that portion of our fellow citizens who have been educated for mechanical pursuits, and which brings them into an odious comparison with felons, without any equivalent to the public. I cannot hesitate in saying, that such a monopoly is in principle unjust, and that it ought to be corrected. Every citizen, and all classes of citizens, have a common and equal interest in the administration of justice, and the punishment of crime, and the burthen of the expense incurred in the promotion of those objects, like all other public expenses, ought to fall equally upon all, in proportion to the taxable property; and any system which violates this principle, either directly or indirectly, is subversive of that equality in rights and duties which is the foundation of our government. Least of all, should such a burthen fall upon the mechanic, agriculturist, or any other portion of the people who derive their property by actual labor, for the plain reason that they are the least able to bear it.

Whatever difficulties there may be in relation to this subject, (and I confess that, to myself, in common with others, when this subject was first agitated, they seemed to be of a serious character,) I cannot doubt but that it is in the compass of legislative wisdom to devise and perfect a system which will relieve the mechanics from the present injurious consequences to them and their business, of which they so justly complain, and at the same time to enable the convicts to support themselves. I do not doubt that branches of industry may be pursued by them which will attain that end, and that will not conflict with the ordinary mechanical business of the country. It has occurred to me, that the production of silk and its manufacture might be advantageously substituted for the present employment of the convicts. But I have not had sufficient time, or information on the subject of its culture, to come to any conclusion on this particular branch of the subject. I allude to that experiment, for the purpose of showing that the subject of the employment of convicts is a large and wide field, open to great improvements, and that there is no insuperable difficulty in arranging a system equally beneficial to the state at large and to the mechanics. Certain it is, that such a system seems to us no more impracticable than the attainment of the present condition of penitentiary discipline did fifteen years ago. Indeed, experience has proved that in political science, as well as in

the mechanic arts, the greatest obstacle to improvement is the belief that perfection is already attained.

I am, sir, with great respect for yourself and the other members of the committee, your fellow citizen,

W. H. SEWARD.

RUDOLPH SNYDER, Esq., Chairman of the Corresponding Committee of Mechanics' State Convention.

Albany, October 18, 1834.

SIR,—I have received your letter of the 14th instant, written in behalf of the Central Corresponding Committee of the State Convention of Mechanics, requesting my views "on the subject of employing the convicts in our state prisons at mechanical labor as at present conducted." The views and feelings of that portion of our citizens engaged in mechanical business, disclosed lin their memorials, and by their committees to the Legislature at its last session, impressed me with the importance of the subject, and I united my efforts with those of the persons particularly interested, to have such an investigation instituted, relative to the effects of the present system, as would enable the Legislature to judge correctly of the evil complained of, and to apply the proper remedy.

That the labor of convicts in our state prisons, as now conducted, is injurious to several branches of mechanical business, is generally conceded, and the only diversity of opinion on the subject is as to the extent of the injury and the practicable means of removing it. The evil being admitted, it is the imperative duty of the legislature to apply a corrective, and I shall exert my influence, in whatever situation I may be, in favor of all proper measures for the attainment of that end. That any class of citizens who yield obedience to the laws, and contribute to the support of government should be injured by the means used for the punishment of malefactors, is manifestly unjust; a system of prison discipline which necessarily produces such a result is clearly wrong; and a government which sustains it, neglects one of its obvious duties, the duty of protecting the equal rights of all. It is consoling to our humane feelings, to believe that penitentiaries have enabled the governments which have established them to dispense with sanguinary punishments in almost all cases, and otherwise to mitigate the severity of their penal code, with at least an equal chance of preventing crimes, and a much greater one of effecting reformations. I still cherish this belief. The evils complained of are not in my opinion the inevitable effects of the penitentiary system, and I feel confident that they can be remedied, and all the good expected from this system, (except perhaps only that of making the labor of convicts a source of revenue,) be fully realized. It must be admitted that the return to the bosom of society of those who have been the inmates of state prisons, and still retain their vicious propensities, is a great moral evil, which may, I hope, be somewhat mitigated by judicious regulations on this subject; but it cannot, I fear, be wholly prevented, without effectually destroying all the hopes of those who have resolved on reformation. The great difficulties attending this part of the subject should not, however, cause it to be abandoned in despair. I indulge a confident belief that the committee, who are examining this subject in all its bearings, will present such facts and views, not only in regard to the injurious competition of the labor of convicts with the industry of our mechanics, but also in relation to the moral evil above mentioned, as will enable the next legislature to fulfil the just expectations of those who suffer by this competition, and of the community at large in respect to this moral evil. To accomplish these objects I shall most cheerfully exert my influence.

I am, with great respect, yours, &c.

W. L. MARCY.

RUDOLPH SNYDER, Esq., Chairman, &c.

The following copy of the letter sent to the Central Committee of the Mechanics' Convention, Utica, was furnished to the undersigned on Saturday, by Mr. Stilwell, in consequence of not having been received by said Committee in time to be inserted in their circular received here on that day.

JOSEPH P. SIMPSON,
Chairman Cor. Com., N. Y.

New-York, October 28, 1834.

SIR,—Your favor is before me, and has received that consideration which its importance merits.

My views on the subject to which your letter has called my attention have been freely expressed for years past, and are before the public. It will not, therefore, be necessary for me to say much at this time.

I have long since been convinced that a radical change should be made in the application of convict labor, and indeed the whole economy of our state prisons.

As a legislator, I have constantly felt the necessity of providing a remedy for every admitted evil, but time and public sentiment are required to effect all the changes we desire. The method which has been adopted

by you is of all others the most certain of crowning your labors with success. And we may now indulge the hope, that the time is at hand when the constituted authorities will present this subject in a proper manner before the Legislature of this State.

I have long labored in the cause in which you are engaged, and whether in public or private life, I shall continue to feel the same desire for the success of correct principles and the enactment of wholesome and just laws. I remain your fellow citizen,

SILAS M. STILWELL.

To RUDOLPH SNYDER, Esq., Chairman of Central Committee of Mechanics' Convention.

[From the New-York American.]

The opinion is now generally prevalent, that some change must be made in the employment of the inmates of our State Prisons, to relieve the mechanical classes from the effect of their competition, and this opinion will doubtless be confirmed by the report of the committee to the next Legislature. The question will then arise—in what way can the change be best effected?

In reflecting upon the subject, the following plan has occurred to me, and I offer it as a suggestion. Good roads are among the most important public conveniences, diffusing their benefits universally, and they are also one of the best investments of public wealth. Their construction will *interfere* with none of the general avocations of society, but, on the contrary, will directly or indirectly promote the interest of all pursuits. Can the labor of the convicts be applied to this object? I think it can without inconvenience or difficulty, and at the same time the present prisons be useful auxiliaries to the plan, which I will concisely describe.

The convicts to be divided into companies of ten, twenty, or thirty, or as many as one individual can manage; each company to be provided with a strong moveable prison, composed of apartments, say four by seven feet, equal to the number of the company, for security at night, with moveable accommodations for cooking, &c. &c.: all of which is entirely practicable. A corps of engineers, for the survey and direction of the construction of roads on a great and permanent scale, to be established, who shall direct the operations. When a continuous line of road is decided upon, these companies to be placed upon it at proper distances, and employed upon it till it is finished in the best manner possible. When this is completed, then move to another, until the whole State is traversed by good roads, if we are so unhappy as to have convicts to construct them.

If the prison at Sing-Sing could be made as it was, there is not the least difficulty, by the adoption of a similar system of management, of applying the same labor to the object proposed.

The operations to commence on the 1st of April, and be continued until the 1st of December—eight months: the convicts then to return to their respective prisons, and spend the winter in the acquisition of knowledge, and in the duties of religion, with the exception of such labor only as would be useful to their winter establishments, and in preparation for their summer campaign at road-making, rendering it a season of rest and moral improvement, to which they might look forward during their months of toil with hope and pleasure, and which, by being continuous, would be more efficient, as constant application to any given subject is more efficient than the same efforts, if desultory.

These are mere hints, to induce reflection in those to whom is entrusted the direction of these important matters, and I feel satisfied they are practicable, and deserving of at least a trial, the best mode of testing any project of importance. HANCOCK.

A MECHANIC OF TALENT IN HIS PROPER STATION.—The workmen of Paris deputed M. Ch. F. Berenger to represent them at the late Scientific Congress at Poitiers. This gentleman, who was formerly a journeyman watchmaker, has by his strong sense and his talent raised himself to a very respectable rank as a writer, and has published a series of remarkable articles on social reform in a journal called *Le Bon Sens*, which is under the direction of M. Cauchois Lemaire. His instructions were not only signed by a number of operatives, but by the two principal editors of a daily Paris journal, several men of letters, tradesmen, and respectable women. The objects of his mission were to call universal attention towards the gradual suppression of customs' duties; to point out the evils of the municipal financial system of France, whereby there were as many custom-houses established as there were towns having an octroi; to insist upon the necessity of a better system of education for artists, agricultural laborers, and women, and of an augmentation of the wages of the latter; to suggest measures for putting an end to the hostility between workmen and their employers, and also to call attention to the increasing number of illegitimate children. M. Berenger's expenses were provided for by the voluntary contributions of his constituents, who also mentioned in their instructions, in case po-

litical questions should be entered upon at the Congress, they suggested that the most essential points to be considered would be a more extended scale of eligibility for deputy, that the deputies should be suitably paid for their services, &c. &c.—[French paper.]

The Principles and Practice of Constructive Carpentry, being a Full and Complete Treatise on the Theory and Practice of Carpentry and Architecture, compiled from the Works of Tredgold and Nicholson, and other Authorities, with the Latest Improvements in every Branch of the Art. Royal 8vo. No. 1 : New-York, W. Norris, 1 Nassau street.

It has ever been our decided opinion, that a most important part is performed, in the extension of knowledge, and in promoting the general advancement of society, by the publication of treatises on the mechanical arts.

Mathematical, like every other kind of science, remains a dead letter until it be applied "to the business and affairs of men;" on the contrary, however, when it is applied to the useful arts, it extends the views of the artist, substitutes certainty for uncertainty, security for insecurity; it informs him how to raise the greatest works with confidence, and how to produce stability with economy, or, in its own language, how to obtain a maximum of strength with a minimum of materials.

There is perhaps no class of mechanical arts so directly capable of receiving improvement from the researches of men of science, as those connected with building; neither is there any that has received a greater share of their attention. But these researches have not benefitted practical men in proportion to the extent to which they have been made. They are too often given to the world in works which are either so expensive as to be inaccessible to the greater number of men of business, or so completely scientific as to be almostuse less to all but men of science themselves. Something may also be attributed to a kind of distance and jealousy which appears to exist between theoretical and practical men; and which has, perhaps, sometimes prevented the practical mechanic from benefitting by scientific researches, the results of which have been within his reach. But these prejudices are fast wearing out. Of this fact we need no better proof than the encouragement which begins to be given to popular treatises on mechanics, to mechanics' magazines, and to the formation of mechanics' institutes.

One or two attempts have already been made to treat the subject of CARPENTRY on mathematical principles. "The Carpenter's Guide," by Peter Nicholson, is a very excellent and justly popular work, but it is almost entirely confined to what is termed "finding the lines;" and although it fully developes the methods of geometrical construction, it does not enter at all into those mechanical principles, a knowledge of which is necessary to enable a carpenter to tread with certainty and economy out of the usual routine of his operations. This part of the subject has, however, been taken up in "Elementary Principles of Carpentry," by Thomas Tredgold, civil engineer; and he who possesses these two treatises, and can understand them, need scarcely wish for any other work upon the subject. But in both of them, especially in the latter, a great many algebraic formulæ are used, which but few practical carpenters or builders understand; moreover, to purchase both of those works may be beyond his means, especially at that period when it is most desirable that he should be in possession of such works.

The work before us is intended to combine the whole substance of both these treatises, with such additional matter as may have been accumulated since the time of their publication. Something is promised on the construction of canal locks and water wheels. The architectural part will also be more full than is general in such works. The number just published contains a short system of practical geometry, with part of a treatise on the equilibrium and pressure of beams, illustrated by three copper-plate engravings. The mechanical principles are exhibited in a plain and simple manner, mathematically correct, yet without requiring more previous mathematical knowledge in the reader than is necessary to work a rule-of-three question. The general object of the work is well expressed in the following extract from the prospectus:

"The work is compiled with especial reference to the operative carpenter. It is intended for the use of the workman or the apprentice who may wish to gain a more extensive knowledge of his art, and who may aspire to such skill and information as will enable him to design and execute the greatest works with elegance and durability, and in due time to assume the highest standing in his profession—a point which any man may honestly aim at, and to which a good resolution and vigorous exertion, properly directed and persevered in, will seldom fail to conduct him. To aid such laudable efforts is one great object of this work. But it is not to the carpenter only that an acquaint-

ance with the principles of construction is useful—such knowledge is almost equally necessary to the architect, the civil engineer, and all persons in any way connected with building. 'Construction is the anatomy of architecture; it is the very base upon which the art of design must be founded, and on the nature of the base must depend the excellence of the superstructure.'

"Although the 'Principles and Practice of Constructive Carpentry' will be compiled in such a manner that it may be readily comprehended by a mechanic of the humblest education, it will contain much practical matter, both original and copied, that will be of great utility to individuals of higher acquirements; and much useful information, which can only be obtained by long experience, or which lies scattered through a number of expensive volumes."

The proposed arrangement of the work is excellent, beginning with simple principles and regularly progressing to the most elaborate workmanship. The typographical execution is of the first quality, and the publisher appears to have spared no expense in order to bring the subject in as clear and pleasing a manner before the physical, as the writer has brought it before the mental eye of the reader.

We would earnestly recommend the study of such works as this to all mechanics. No man can know too much concerning the business by which he obtains his bread, and on which hangs all his hopes of rising in the scale of society. Other kinds of knowledge *may*, this is *sure*, to be useful to him. Such knowledge he *must* possess, if he would ever rise beyond mediocrity in the exercise of his art. And to those who are not already in possession of good works of the kind, we would recommend "the Principles and Practice of Constructive Carpentry." The method of publication, in monthly numbers, 25 cents each, renders it accessible to every one; and, from what we have already seen of it, we have no doubt that it will prove a most useful and practical work.

Crystalline Lenses.—Sir David Brewster, a very distinguished writer on the science of optics, is desirous of procuring crystalline lenses, or, in other words, magnifying glasses of the eyes of American animals. Put the entire eye into a well corked and sealed bottle of spirit, or take the lens from the globe, and throw it for a few minutes only into boiling water. When taken out, dry it and wrap it in paper, writing upon it the name of the animal to which it belonged.—[Scientific Tracts.]

Connection between Science and Theology.—It is much to be regretted that we have no modern Rays, Derhams, Boyles, or Nieuwentyts, to make the light of our recent discoveries in science bear upon the illustration of the perfections of the Deity, and the arrangements of his providence. Since the period when those Christian philosophers left our world, many of the sciences which they were instrumental in promoting have advanced to a high degree of perfection, and have thrown additional light on the wisdom and intelligence of the Divine mind, and the economy of the universe. Natural history has widely enlarged its boundaries; our views of the range of the planetary system have been extended; the distant regions of the starry firmament have been more minutely explored, and new objects of magnificence brought within the reach of our observation. The nature of light has been more accurately investigated, the composition of the atmosphere discovered, the properties of the different gases ascertained, the powers of electricity and galvanism detected, and chemistry—a science completely new-modelled—has opened up the secret springs of nature's operations, and thrown a new light on the economy of Divine wisdom in the various processes which are going on in the material system. Is it not unaccountable, then, that no modern system of *Physico-Theology*, embracing the whole range of modern discoveries, should have proceeded from the pens of some one or other of our most distinguished philosophers! Does this circumstance seem to indicate that, since the early part of the last century, the piety of philosophers has been declining, and the infidel principles of the Continental school gaining the ascendancy! Infidelity and fatalism very generally go hand in hand. When the truths of revelation are once discarded, a species of universal scepticism, differing little or nothing from atheism, takes possession of the mind; and hence we find, that in the writings of such men as Buffon, Diderot, and La Place, there is not the slightest reference to final causes, or to the agency of an All-pervading mind that governs the universe.

That the connection between science and theology we have been recommending is not a vague or enthusiastic idea, appears from the sentiments which have been expressed on this subject by the most eminent philosophers. Throughout the whole of the works of the immortal Newton, we perceive a constant attention to final causes, or to the great purposes of the Deity. It was the firm opi-

nion of this philosopher, "that, as we are every where encountered in our researches, by powers and effects which are unaccountable upon any principles of mere mechanism, or the combinations of matter and motion, we must for ever resort to a Supreme power, whose influence extends over all nature, and who accomplishes the wisest and most benevolent ends by the best possible means." Maclaurin, the friend of Newton, and the commentator on his *Principia*, expresses the following sentiments on this subject, in his "Account of Sir I. Newton's Discoveries." "There is nothing we meet with more frequently and constantly in nature than the traces of an all-governing Deity. And the philosopher who overlooks these, contenting himself with the appearances of the material universe only, and the mechanical laws of motion, neglects what is most excellent; and prefers what is imperfect to what is supremely perfect, finitude to infinity, what is narrow and weak to what is unlimited and almighty, and what is perishing to what endures for ever.—[Dick on the Diffusion of Knowledge.]

Supplemental Report of the Seventh Annual Fair of the American Institute.

The managers, anxious to do exact justice to the exhibitors, and to correct any errors that may have occurred in the confusion incident to a public exhibition, where more than five thousand articles were presented, have deemed it proper to make a supplemental report. They have been induced to do this, partly in consequence of certain facts having been brought to their knowledge since the exhibition, which, if known, would have varied their award. The extent of the fabrication of certain other articles of great utility, and of general consumption, demand a more pointed public notice than was given in the original report. They are satisfied of this, also, partly from information obtained since the exhibition, as well as from a careful review of the reports of the judges.

The case of incorruptible artificial teeth will first be noticed.

When the judges on these articles first met and reported, specimens from only two exhibitors had arrived. Afterwards, S. W. Stockton brought other specimens, and challenged competition. The successful competitor in the first instance consented to enter the list of competition again, and thereby waived the advantage he had acquired by the decision of the judges at their first meeting. At their second examination, the decision was unanimous in favor of Stockton's specimens. But the fact of this mutual agreement, and the waiving on the part of the party interested in the first decision of the judges, not having been positively ascertained, no notice was taken by the managers of either decision in the awarding of premiums. But the judges having subsequently certified that the last examination was with the consent and approbation of the successful competitor in the first instance, the managers have deemed it due to Mr. Stockton that he should be noticed; they therefore award to S. W. Stockton, of Philadelphia, a silver medal, for the best specimen of highly perfected incorruptible artificial teeth. And inasmuch as J. Plantou & Sons, of Philadelphia, exhibited the second best specimens, at both examinations, the managers award to them a diploma.

The managers have carefully examined into the extent and importance of the manufacture of watch dials, by Mullen & Ackerman, No. 101 Warren street, city of New-York. The accuracy and elegance of the workmanship, the facility with which they can be multiplied, the great demand they are competent to supply, and the saving effected for the consumers, entitle them, in the opinion of the managers, to a gold medal, in lieu of the silver medal heretofore announced, as the "reward of skill and ingenuity for the manufacture of gold watch dials."

And the managers also award to Mullen & Ackerman, a diploma, for handsome specimens of filagree jewelry.

Mr. T. Fossard's specimen of blue dye, the committee deem important. A cheap substitute for indigo would be of incalculable value; and the examinations the specimen underwent have made a favorable impression on the minds of the managers. They therefore did not hesitate to award him a diploma.

Matthias Ludlum, a journeyman mechanic, produced a beautiful brass tea-kettle and heater, which were made, by the consent of his employer, expressly for the Fair. They were exhibited in the name of D. E. Delavan, who, for these and other articles taken by him to the Fair, received a silver medal. Mr. Ludlum has since applied, and claimed the premium. It is desirable that the rewards of the Institute should, as far as possible, reach the ingenious producer, where he is brought to a knowledge of the Institute. The managers, therefore, in accordance with the desire to reward obscure merit, award to Matthias Ludlum a silver medal, for a beautiful brass tea-kettle and heater.

Choice specimens of turned tool handles were exhibited by N. Cowenhoven. Mr. C.'s manufactured tools are sold extensively in

this city; he is entirely self-taught, and deserves a public notice for his ingenuity. The managers award to him a silver medal.

The managers also award to Alfred Willard, of Boston, a diploma for shell worked combs, elegantly carved.

To Francis Smith, for brass shovel and tongs, made by him, and delivered by Mr. Delavan at the Fair, the managers award a diploma.

They also award to Geo. Bird a diploma for imitation mouldings.

Miss Sarah Seager, 233 Thompson street, is entitled to praise for a handsome flower-piece, painted in oil. The managers award her a diploma.

Specimens of cut and pressed glass from the Union Glass Company, Philadelphia, were worthy of commendation.

Post's hame-collar block has met with much commendation.

Robert Fazon's improved cooking stove has also been highly approved; sold at No. 13 Bowery. A diploma is awarded him.

James Van Dyke, Brooklyn, Long Island, exhibited samples of excellent mustard made by him. It is hoped, as an American article, it will find favor with American consumers.

Messrs. E. & T. Fairbanks exhibited their patent portable scales, which are a convenient and excellent article—for which a diploma was awarded. A specimen model may be seen at the office of the Institute, No. 41 Cortlandt street.

T.W. Clisby, No. 12 Tenth street, exhibited an ingenious architectural engraving of the Ionic capital of the temple of Ilyssus, as described by the inventor. The illustrations profess to show the centres of the spiral scrawls of the volute, and to prove that they accord with mathematical principles. The engraving may be seen at No. 41 Courtlandt street.

A specimen of Asiatic marble, of the Breccia species, imported in its rough state, hewed and polished in this city—a beautiful article. Exhibited by Warren Gould. A diploma.

The managers have already granted to Obadiah Parker a gold medal for his artificial stone, and for the purpose of enabling him to make more public his discovery, they have, at his request, also awarded him a diploma.

To Charles Edwin Ely is also awarded a diploma for a finished specimen of ornamental writing engraving.

The managers award to Kutz & Adams, No. 300 Broadway, manufacturers of rules, mathematical instruments, &c., a silver medal, for two drafting scales, and two engineer sliding rules: specimens exhibiting great skill, accuracy, and elegance. An accompanying explanatory book shows the application of the different rules to multiplication, division, rule of three, tables of the areas and circumferences of circles, mensuration of superficies and solids, weighing of metals, &c.: a happy illustration of mental labor saving. They may be seen at the Library of the Institute, 41 Cortlandt street.

The managers, in accordance with the wishes of the Denny Manufacturing Company, and deeming the progress of the manufacture of the kind of articles exhibited by them of national importance, award to the said Company for their specimens of superfine black and blue broadcloths, in lieu of a gold medal, a silver pitcher.

The fanlight of T. Thomas—vitrified glass, displaying the American arms surrounded by the stars of the 13 States within a tri-colored border—deserves particular commendation for elegance of execution. The long lost but beautiful art of staining glass is revived and executed in New-York with a degree of perfection not surpassed perhaps by any of those relics of former times that have reached us. Mr. Thomas's specimen may be examined at No. 41 Cortlandt street.

Prize Essay.—The Hervean Society has given out the following subject for a prize essay for 1835: *The Influence of Atmospheric Pressure on the Animal Economy.* The prize to be won is a silver medal, with suitable inscriptions, or a quarto copy of the works of Dr. Harvey. The manuscript must be sent to William Moncrief, M. D., No. 7 York Place, or Richard Heric, No. 8 George Square, London, so as to be received by the first day of January next. Each dissertation must necessarily be accompanied by a sealed letter, containing the name and address of the writer inscribed on the back, with a motto, which motto must also be prefixed to the manuscript to which it belongs. There are many of our correspondents who might, with considerable prospect of success, send on an essay very seasonably.—[Scientific Tracts.]

Consumption.—Although Dr. Rush declared that consumption was wholly unknown to the American Indians, the famous Red Jacket, in an interview with a medical gentleman near Buffalo, in 1823, gave the particulars of no less than seventeen cases of pulmonary consumption among his relatives, including *ten* or *eleven* of his own children, who died of that insidious disease. —[Ibid.]

Ballooning.

Hartford, Oct. 4, 1834.

To the Editor of the Mechanics' Magazine:

Dear Sir,—I have this morning received the September number of the Mechanics' Magazine, and was somewhat amused to find that my plan for ærial journeying had been so nearly anticipated by B. G. N. However, I shall not contend with him about *flying*, but should be unwilling to have the public suppose that I had borrowed any thing from him, inasmuch as I had communicated my plan, with a drawing of the same, to Mr. Burden, of Troy, in January last; and had often expressed my confidence in it for ten years past.

There were some slight omissions in the communication of my plan, with regard to the method of ascending, &c., which I should be pleased to have corrected, as follows: After the words "vice versa," (which occur but once,) it should be read, "but the consumption of fuel and water may be counterbalanced, and the balloon may be made to ascend or descend occasionally, by its contraction or expansion, by means of the following arrangement. Eight small cords proceed from the inward sides of the eight long rods, and meet at the centre of the balloon, where they pass over eight small pulleys, and become united in one, which extends a few feet horizontally aft, and, passing over another pulley, proceeds downward, through a small aperture in the bottom of the balloon, to a small crank windlass, under the control of the engineer." Yours, &c.

RUFUS PORTER.

[In justice to Mr. Porter, we are bound to state that his communication was received prior to the publication of that of B. G. N. —ED. M. M.]

MAHOMEDAN MONTHS.—In chronology and history, as well as in all public documents, the Mahomedans use months of thirty and twenty-nine days alternately, making the year thus to consist of 354 days. Eleven times in thirty years one day is added to the last month, making 355 days, therefore, in that particular year. In common reckoning the year is purely lunar, consisting of 12 months, each one commencing with the appearance of the new moon, without any intercalation to bring the commencement of each year to the same season.—[Scientific Tracts.]

FROGS.—On exposing frogs to the temperature of 0° cent. 32° Fahr., in humid air, in order to suppress perspiration by evaporation, they lost by transudation, in different experiments, the thirtieth part of their weight. Transudation is more abundant in these reptiles than in man, though the latter may be placed in circumstances much more favorable.—[Ibid.]

Miscellanies, Foreign and Domestic.

[Continued from page 223.]

12. *Carrageen, or Irish Moss.*—Chondrus crispus, Lyngbye, Hydropt. Dan. p. 15, t. 4. Greville, Algæ Brit. p. 129, t. 15. Sphaerococcus crispus, Agardh, Sp. Alg. 1. p. 256. Fucus crispus, Lin. Syst. Nat. ii. p. 718. Turn. Hist. Fuc. p. 216–7.

This moss is common on rocks and stones, along the coast of Europe; it is also a native of the United States. A very variable species, but easily recognized when the eye is accustomed to it. The genus Chondrus belongs to the order Florideæ of the great natural family of the Algæ. All the species have a cartilaginous frond, which is flat, without nerves, dichotomous, dilated at the extremity, and of a livid reddish color; the fructification consists of scattered capsules, mostly immersed in the frond, rarely pedicellate; seeds minute, rounded.*

This moss, abounding on the southern and western coasts of Ireland, has been used by house painters for sizing; it has likewise been highly esteemed by the inhabitants as a dietetic remedy for various diseases, more especially for consumption, dysentery, rickets, scrofula, and affections of the kidneys and bladder. Dissolved by being boiled in water, a thick jelly is produced, more pure and agreeable than that procured from any other vegetable, which is found to agree better with the stomach than any prepared from animal substances. Its chemical composition appears to me, as far as I have been able to trace it, of very considerable importance; the jelly formed by dissolving it in hot water is not only composed of starch, but contains a large proportion of pectic acid; a considerable quantity of sulphur, and some chlorine and bromine, and another acid combined with lime, have been discovered,—the latter proves to be the oxalic acid.

Neither the fungic nor boletic nor lichenic acids could be detected, and the existence of iodine I have not been able as yet to detect. By extracting the pectic acid with caustic potassa, I found the moss taken up and altogether dissolved; and after treating the gelatinous mass with chloride of calcium, muriatic acid, and applying alcohol to separate the acid, at least 0·6 of this last was the result.

By reducing the moss to coal and dissolving it in water, sulphuretted hydrogen gas was evolved very abundantly; protoxide of iron, subcarbonate of potassa, diluted sulphuric acid, and lime water, gave copious precipitates.

The chemical characters of this moss are too interesting to be considered as completely determined by the few superficial experiments

* I am indebted to Dr. John Torrey, for the communication of the botanical description.

undertaken to discover its properties, especially as they were made at a time when I have been continually interrupted by an attention to the duties of my profession, and I consider them as having been undertaken more for the satisfaction of my curiosity, than as tending to a complete and scientific investigation of such an invaluable medical substance as carrageen, but I hope to be able very shortly to develope with more accuracy the entire composition of this singular moss.

The carrageen seems to possess qualities similar to the Iceland moss, which, according to Berzelius' last analysis, (a master-piece in every respect,) consists in 100 parts of 3·6 syrup, 1·9 bitartrate of potassa, tartrate and some phosphate of lime, 3·0 bitter principle, 1·6 green wax, 3·7 gum, 7·0 coloring matter, like extract, 44·6 lichen starch, 36·2 starch-like matter; but carrageen is without bitter principle, contains nothing but soluble matter, and the quantity of nutritious jelly produced by a small portion of it gives it the most indisputable preference. It was first introduced by Dr. Reece, who considered it a most important article of food for invalids, and Doctors Sulby, O'Reilly, and Sir Henry Halford, speak of the carrageen as the most nutritious article of food for delicate and weakly children. In this respect it is certainly superior to arrow root, sago, &c., being more highly nutritious, easy of digestion, and pleasing to the taste.

Prepared with warm milk and sweetened, it is most particularly recommended as a breakfast for consumptive patients.

Decoction of moss, made by boiling half an ounce clear moss in a pint and a half of water or milk until reduced to a pint, is recommended as food for children affected with scrofulous or rickety diseases, for such as are delicate and weakly, and for infants.

There are some printed directions for the manner of using the carrageen moss for medicinal and culinary purposes, accompanying some imported from England, from which I shall make here an extract.

Directions for using the Moss medicinally.—Steep a quarter of an ounce of moss in cold water for a few minutes—then withdraw it, (shaking the water out of each sprig,) and boil it in a quart of new or unskimmed milk, until it attains the consistence of warm jelly—strain and sweeten it to the taste with white sugar or honey, or, if convenient, with candied Eryngo root; should milk disagree with the stomach, the same portion of water may be used instead. The decoction made with milk is recommended for breakfast for consumptive patients; and with water will be found a most agreeable kind of nourishment, taken at intervals during the day, the flavor being varied with lemon-juice or peel, Seville orange juice, cinnamon, or wine of any sort most congenial to the taste.

The decoction in water is also taken for the relief of cough at any time in the course of the day, when it is troublesome, and it is for this purpose simply sweetened with honey.

In dysentery, the decoction, either in milk or water, may be administered with equal advantage, and in addition to the sweetening matter, if a tea-spoonful of the tincture of rhatany be mixed with each cupful of it, tone will thereby be given to the intestines, at the same time that nourishment will be conveyed to the system, and irritation prevented—a large tea-cupful of the decoction may be taken three or four times a day.

As a pleasant strengthening food, boiled with milk and strained, with the addition of a little sugar, it is unrivalled for infants. Persons take it in this way for breakfast or supper, with the happiest effect, who are sustaining an attack of the cholera.

Culinary Directions.—To make Blanche-Mange: take half an ounce of moss, and having cleansed it by the process above described, boil it in a pint and half new milk, until it is reduced to a proper thickness to retain its shape; to be sweetened and flavored with lemon, white wine, or any thing to suit the palate.

To make Orange, Lemon, or Savory Jellies: use a similar process, substituting water for milk—add lemon, orange, herbs, &c. according to taste.

To make White Soup: dissolve in water, afterwards add the usual ingredients.

It only remains to state, that the Carrageen, or Irish Moss, as a domestic article, is peculiarly interesting; it is the best thickener of milk, broths, &c., makes excellent jellies, and for Blanche-Mange is equal to most expensive ingredients, whilst the cost is comparatively nothing; it may be used instead of isinglass, jellies, &c.

13. *Oil of Copaiva as a test for the purity of the sulphuric ether.*—If ether is not fully deprived of water and alcohol, it forms when united with oil of copaiva an emulsion without dissolving it completely, whereas it is soluble when pure, in every proportion.

14. *Discharge of the stain of indelible ink, by corrosive sublimate.*—Dr. John Dickson, of South Carolina, in a letter to the editor, dated October 24, 1833, states that Mrs. Dickson had accidentally observed the discharge by corrosive sublimate from a handkerchief of the color produced by the nitrate of silver, and it was soon found that the same effect was produced upon linen, cotton, and the human skin. On the cloth* the stain partially re-appeared after washing, but on the skin it did not return.

The following circumstances led to Mrs. Dickson's observation: a weak solution of nitrate of silver, (warmly recommended in Eberle's Practice,) was used as a lotion in treating some cases of erysipelas; its power of producing a dark tint was well known to Dr. D., but as no caution is given in the above work, it was presumed that no such consequence would follow from using so weak a solution: but Dr. D. had the mortification to find the effect produced, and a solution of corrosive sublimate was then successfully applied to remove the stain produced by nitrate of silver. The following suggestions are made by Dr. D.:

* It is not specified what cloth is intended, but it is presumed that it is the fibre of the linen and cotton.

1. Not to use the nitrate on the face at all, especially in the case of females.

2. To take care that the solution reach only the portions of the surface that are in a state of erysipelatous inflammation, since there is reason to believe that it is less likely to stain the inflamed part, and, at any rate, vesication, desquamation, or absorption will soon remove the skin and stain together in the diseased surface, while this will not happen so soon in the healthy portion. Of course this is not of so much importance in parts habitually covered by the dress.

3. To have the parts to which the nitrate is applied protected from the light during the use of it.

4. To wash away the solution before it dries in the least from the fingers, &c. dipped in it in making the application. This may be done in common clean water, and if not effectually done in that, it may be certainly done in a weak solution of corrosive sublimate, as appears from our experience.

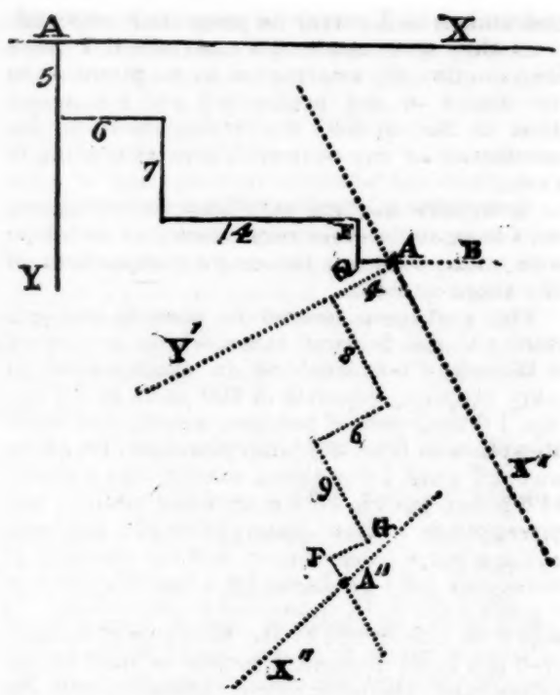
On the Location of Railroad Curvatures; being an Investigation of all the Principal Formulas which are required for Field Operations, in laying Curves and Tangent Lines, to pass through Given Points. By J. S. Van De Graaff. [From the American Railroad Journal.]

(Continued from page 206.)

In a long curve it cannot be expected, in consequence of little inaccuracies which are unavoidable in chaining, deflecting, &c., that the stations will be found, when they come to be actually traced, to agree *exactly* with the point obtained for an integer chain, by the system of co-ordinate axes; but the difference will not be such as to produce any sensible derangement in subsequent parts of the curve. And it may be observed that the point $\left\{\begin{array}{l} x=a+b+c+h \\ y=d+e+f+h \end{array}\right\}$, which was selected only for the sake of convenience in having the change of curvature to occur at the extremity of a *full chain*, when the whole line comes to be ultimately traced with the proper curvatures, will be situated within the nearest full chain of the given point $\left\{\begin{array}{l} X=a+b+c \\ Y=d+e+f \end{array}\right\}$; and the same curve which meets the former point will also *pass through* the latter, if n be the nearest integer number *greater* than N.

The following example will more fully explain the principles contained in the present article. Let AX be a given tangent line, and A the given origin of a certain curve which is required to be laid in such a manner as to pass through the two points F and G, whose positions are given. [See following figure.]

Take the lines indicated by the figures 5, 6, 7, and 14, to represent a system of rectangular lines, traced from the primitive origin at A, to the *first designated point* F; and let those figures indicate the length of each line respectively in chains, as determined by measurement in the field. The equations for the point F



will then be, $\left\{\begin{array}{l} X=6+14 \\ Y=5+7 \end{array}\right\}$; that is, $X=20$ and $Y=12$; and therefore by (XV.) Cot. $\frac{1}{2}D''=\frac{20}{12}=1.66667$; or, $\frac{1}{2}D''=30°\ 58'$; or, $D''=61°\ 56'$. And again by (XV.) Sin. $T=\frac{\text{Sin. } 61°\ 56'}{40}=\frac{.88240}{40}=.02206$; or, $T=1°\ 16'$, which is the modulus of curvature necessary to trace a curve from the origin at A, passing through the first given point F. And now to determine whether the point F will coincide with an integer number of chains, in the curve, from the origin A, we have by (XVI.),

$$N=\frac{61°\ 56'}{2°\ 32'}=\frac{61.93}{2.53}=24.48;$$

which is not an integer number. The point F, therefore, does not correspond to an integer number of chains in the curve; and a new point, A', must in consequence be found, which will coincide with the extremity of the 25th chain *in the same curve*. We then have $n=25$, $T=1°\ 16'$; or, $2nT=63°\ 20'$; and by (VII.) $x=\frac{\text{Sin. } 63°\ 20'}{2\text{ Sin. } 1°16'}=\frac{.89363}{.04422}=20.21$ chains, $y=\frac{1-\text{Cos. } 63°20'}{2\text{ Sin. } 1°16'}=\frac{.55120}{.04422}=12.47$ chains. Hence $h=x-X=+0.21$, and $k=y-Y=+0.47$. Let, therefore, the two rectangular lines FQ and QA be traced in a manner similar to the former, and equal to .47 and .21 of a chain respectively, taking care to preserve their directions by references more remote; and a new station A' will be thus obtained, coinciding with the extremity of the 25th chain in the same curve, which passes from the primitive origin at A through the first given point F. The instrument may now be placed at A', and directed into the line A'B, parallel to the primi-

tive tangent AX; and because $2nT = 63° 20'$, therefore, agreeably to (IV.), deflect the angle $BA'X' = 63° 20'$, and the instrument will then indicate the true direction A'X', which is *tangent at the station* A', to the curve subsequently to be traced from the primitive origin at A.

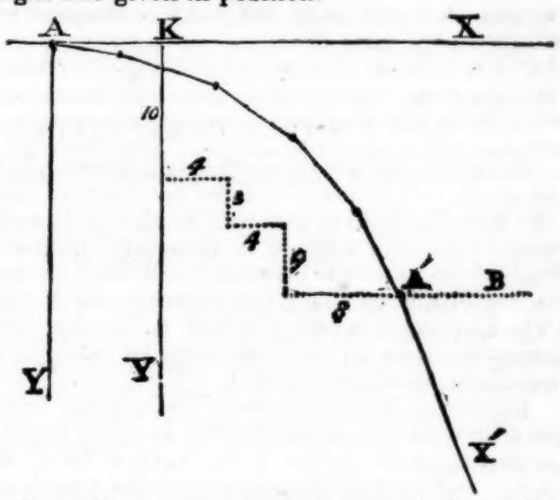
Now, take A'X' and A'Y', for a new system of rectangular co-ordinate axes, agreeably to which let a second system of rectangular lines be traced from the new origin at A', and terminating in the *second given point* G, and indicated in chains by the figures 4, 8, 6, 9, respectively, as before. The equations for the point G will then be $\left\{\begin{matrix} X = 8 + 9 \\ Y = 4 + 6 \end{matrix}\right\}$; that is, $X = 17$, and $Y = 10$; and therefore by (XV.) $\text{Cot.}\ \frac{1}{2}D'' = \frac{17}{10} = 1.70000$; or, $\frac{1}{2}D'' = 30° 28'$; or, $D'' = 60° 56'$. And again by (XV.), $\text{Sin. } T = \frac{\text{Sin. } 60° 56'}{34} = \frac{.87406}{34} = .02571$; or $T = 1° 28'$, which is the modulus of curvature necessary to trace a curve from the new origin at A', passing through the second given point G. And now to determine whether the point G will coincide with an integer number of chains in the curve, from the new origin at A', we have by (XVI.), $N = \frac{60° 56'}{2° 56'} = \frac{60.93}{2.93} = 20.80$; which is not an integer number. The point G, therefore, does not correspond to an integer number of chains in the curve; and a new point, A'', must in consequence be found, which will coincide with the extremity of the 21st chain, *in the same curve*. We then have, $n = 21$, $T = 1° 28'$: or, $2nT = 61° 36'$; and by (VII.), $x = \frac{\text{Sin. } 61° 36'}{2 \text{ Sin. } 1° 28'} = \frac{.87965}{.05120} = 17.18$ chains,

$$y = \frac{1 - \text{cos. } 61° 36'}{2 \text{ sin. } 1° 36'} = \frac{.52438}{.05120} = 10.26 \text{ chains.}$$

Hence, $h = x - X = +0.18$, and $k = y - Y = +0.24$. Let, therefore, the two rectangular lines GP and PA'' be traced in a manner similar to the former, and equal to .24 and .18 of a chain respectively; and a new station, A'', will be thus obtained, coinciding with the extremity of the 21st chain in the same curve which passes from the new origin A', through the second given point G. The instrument may now be placed at A'', and directed into the line A''D, parallel to the first new tangent A'X'; and because $2nT = 61° 36'$, therefore, agreeably to (IV.), deflect the angle $DA''X'' = 61° 36'$, and the instrument will then indicate the true direction A''X'', which is *tangent at the station* A'', to the curve subsequently to be traced from its proper origin at A'.

The calculations of the two cases in this example have been *made out in full*, and expressed verbatim, with the exception only of such words as were peculiar to each case, in order that the principle might be at once comprehended by *all*; for it constitutes one of the most important *systems of operations* connected with the subject of curvatures, when properly understood and skilfully managed.

18. It is proposed to determine the modulus of curvature which will trace a curve from a given tangent line, and from a given *point therein*, in a such a manner as to touch another right line given in position.



Let AX represent that tangent line in which the origin of the required curve is *unknown*, and A'X' that in which the origin of the curve is given at the point A'. Select any arbitrary point K, in the *former* tangent line AX, for the origin of a system of rectangular co-ordinate axes KX, KY: and parallel respectively to those axes let a system of rectangular lines be traced from the origin of the co-ordinates at K, and terminating at that *origin of the curve* which is given in the other tangent line A'X' at the point A'; and by means of those rectangular lines let the angle BA'X' be *measured*, and denoted by D, and which will express the inclination of the two given tangents AX and A'X' to each other. Take the equations

$$\left\{\begin{matrix} X = a + b + c + \text{&c.} \\ Y = d + e + f + \text{&c.} \end{matrix}\right\},$$

as *given* by means of those rectangular lines, and explained in the preceding articles. It is then very evident that the value of the ordinate Y, as thus determined, will not, in any manner whatever, depend upon the point which was selected in the tangent line AX, for the *origin of the co-ordinates;* and consequently that value of Y will express the true ordinate which corresponds with the given point A' in the required curve, as estimated from that *origin of the curve*, which is required to be situated somewhere in the given tangent line AX. And it hence follows from (VII.), that, $Y = \frac{1 - \text{Cos. } 2nT}{2 \text{ Sin. } T}$. But, $D = 2nT$, as appears from (IV.); and this value being substituted in the expression for Y, the following formula will result:

$$\text{Sin. } T = \frac{1 - \text{Cos. } D}{2Y}. \qquad \text{(XVII.)}$$

And thus the modulus of curvature of the required curve may be easily computed after tracing a system of rectangular lines

$$\left\{\begin{matrix} X = a + b + c + \text{&c.} \\ Y = d + e + f + \text{&c.} \end{matrix}\right\}.$$

But that origin of the required curve, which is

situated somewhere in the given tangent line AX, will also in some cases be wanted. Let that origin be at A, and put $\propto$ =AK; and then X = $\propto$, and Y will evidently be the co-ordinates of the point A′, as estimated from the origin A, and axes AX, AY. Hence, by (XIII.) Cot. $\frac{1}{2}$D = $\frac{X = \propto}{Y}$; or, eliminating $\propto$; the result is,

$$\propto = Y \times \text{Cot. } \tfrac{1}{2}D.—X. \quad \text{(XVIII.)}$$

Which makes the required origin known; but in using this formula, it must be observed that the hypothesis here assumed is, that $\propto$ is considered *positive* when it is measured immediately *opposite* to the direction of X from the selected origin of the given co-ordinates X and Y; and consequently, when $\propto$ comes out *negative* from (XVIII.), it must be taken in a direction *coinciding* with X.

Example. Let a system of rectangular lines be traced in a manner similar to those represented upon the figure by the figures 10, 4, 3, &c.; and let those figures denote the length of each line in chains. The angle BA′X′ being measured, let it be found = 60°.

In this case, then, $\left\{\begin{matrix} X = 4+4+8 \\ Y = 10+3+5 \end{matrix}\right\}$; that is, X = 16, and Y = 18. And,

$$\text{Sin. } T = \frac{1 - \text{Cos. } 60°}{36} = \frac{.5000}{36} = .01390;$$

from which is found T = 0° 48′ = modulus of curvature of the required curve. To find the position of the origin A, we have $\propto$ = 18 × Cot. 30° — 16 = 18 × 1.732 — 16 = 31.18 — 16 = + 15.18. Hence measure 15.18 chains from the selected point K, and *backward* as regards the axis KX, of X. The required point A will be then obtained; from which a curve being traced by means of the modulus of curvature 0° 48′, it will meet the given point A′, and come into the given tangent line A′X′. Or, vice versa, being traced from the given point A′ and from the given tangent line A′X′, it will *touch* the other given right line AX at the point A.

It frequently happens, in tracing curves for the superstructure of a railroad upon a graded surface, that AX will represent a *fixed* tangent, and that the point A′ will represent a station in a curve which is also *fixed*, and to which A′X′ is a tangent at that point; and it is then required to pass that curve into the curve AA′ at the station A′ and upon the *common* tangent A′X′. In such a case it will always be the best method, after the necessary modulus of curvature has been computed by means of (XVII.), to trace the curve from A′ towards the other origin at A. For then the two curves will meet at A′ with an integer chain; and the broken chain will come in more conveniently, at the other extremity of the curve, where it meets the given tangent line AX.

The formulas (XVII.) and (XVIII.) will also, in some cases, be highly useful in conducting the location of a line with facility. Suppose, for example, that AX be a given tangent line, whose direction is fixed by some former curve, and particular local circumstances; and let the line A′X′ represent the direction of some bluff, or other obstacle, which makes it desirable for that part of the contemplated road to occupy ground which will correspond with the line A′X′, or differ from it as little as circumstances will permit. In this case, then, having selected any convenient point K, in the given tangent line AX, for the origin of co-ordinate axes, let the system of rectangular lines, $\left\{\begin{matrix} X = a+b+c+ \text{&c.} \\ Y = d+e+f+ \text{&c.} \end{matrix}\right\}$, be traced from that origin, and terminating in such a point A′ as the nature of the ground *and the levels* may require. Then placing the instrument at A′, deflect into the proper direction A′X′, and thus measure the angle BA′X′. Having then all the requisite data for computing the origin A, and the necessary modulus of curvature, to pass a curve through the point A′ and into the direction A′X′, let those items be calculated. It will then be seen, at once, whether the point A′, and the direction A′X′, can both be maintained within the limits of the desired expense and curvatures; and if not, then either some other point A′ must be taken, or some new direction must be assumed. These facts should be always ascertained, and the most judicious line definitely selected, *before any curve is actually traced.* It is, however, necessary to observe here, that, in the location of a line preparatory to the graduation, it will be very seldom proper to trace a curve backward from any selected point A′ to meet the line upon a given tangent AX, as was recommended in the case of a graded surface. For in the first location, integer chains should be always retained when practicable; and which cannot be easily done without tracing the curves and tangent lines continuously. In the case, then, last considered, the following principles should be observed: After the point A′ and the direction A′X′ have been finally selected, and the requisite origin A, together with the modulus of curvature for the required curve, have been already calculated, if that origin does not fall upon the tangent line AX at an integer chain, then select the nearest integer chain for the true origin; and compute a *new modulus of curvature*, which will pass a curve from that latter origin through the designated point A′. It is then very evident that the direction of this curve, in passing the point A′, will differ but little from the direction of the former curve at the same point. When therefore the curve, as last selected, has been laid within one or two chains of the designated point A′, let such a variation be made in the modulus of curvature, for the remaining chain or two, as will restore the *parallelism* of the two tangents, agreeably to principles which will be obvious enough from (V.) In this manner the true direction will be obtained; and although the line will not then pass exactly through the designated point A′, yet it will not vary a material distance from it.

When this system of operation is to be pursued, it will always be convenient, in selecting the arbitrary point K, to take it at an integer chain, counting from the termination of the line as actually laid into the given tangent AX; and

then if $\propto$ does not appear from (XVIII.) to be an integer number of chains, select the nearest integer number to it, and the co-ordinates by which to compute the *new modulus of curvature*, from (XII.) will evidently be $X \pm \propto$, and Y, regard being had to the proper sign of $\propto$, as already explained.

19. Although a system of rectangular lines, traced from given co-ordinate axes, will in general furnish the best data for computation, yet cases sometimes occur when those calculations have to be made from computed curves or curves already laid upon the ground. In a first location, this case will sometimes happen, when, from difficulties which are found in advance of a line, it becomes necessary to change a part of that which was either already computed, or actually laid. Such a case will sometimes occur even when the operations in the field have been skillfully conducted; and in laying curves upon a surface already graded, it will be frequently necessary to compute from curves actually traced; for in that case it will be often required to notice the particular situations of several stations in a curve or tangent line, and which cannot be so readily done in any other manner as by actually laying an approximate line upon the ground. The *notes* of those approximate lines are, moreover, in such cases, *always furnished* from a former survey.

20. Suppose two curves to be laid upon the same tangent line, and let $\propto$ denote the distance between their origins. Let one of those curves have a given modulus of curvature denoted by T, and let it pass through a certain given point at the extremity of the nth chain. It is then proposed to find the modulus of curvature of the other curve, such that it may also pass through the same given point; and it is likewise required to determine the angle of intersection of the two curves at that point.

The co-ordinates of the given point, taken with reference to the origin of the required curve, are obviously $x \pm \propto$ and y; and consequently, taking T′ to denote the required modulus of curvature, its value will be expressed by

$$\text{Sin. } T' = \frac{y}{x^2 + y^2 \pm 2 \propto x + \propto^2},$$ as appears from (XII.) Hence, substituting in this expression, for x and y, their values* as obtained by (VII.), the following theorem will be the obvious result:

$$\text{Sin. } T' = \frac{1 - \text{Cos. } 2nT}{\frac{1 \text{ Cos. } 2nT}{\text{Sin. } T} \pm 2 \propto . \text{Sin. } 2nT + 2 \propto^2 . \text{Sin. } T}. \qquad \text{(XIX.)}$$

The formula thus obtained will be found to be quite convenient for purposes in the field, when the curves are too long to be within the limits of the more simple approximating methods, which will be hereafter explained.

With regard to the double sign, it must be observed that the *negative value of* $\propto$ obtains when the origin of the curve sought is in *advance* of the origin of the given curve, with respect to the direction in which the curves are laid from their origins; and the *positive* value must be taken in the contrary case.

In order to determine the angle of intersection of the two curves, take D′ to denote the number of degrees and minutes contained in the curve whose modulus of curvature is T′, between its origin and the given point, and which will, consequently, by (I.) and (IV.) also express the inclination of the required curve, at that point, to the *common tangent* at the origins. The value of D′ will then be expressed by

$$\text{Cot. } \tfrac{1}{2}D = \frac{x \pm \propto}{y},$$

as appears from (XIII.) Now, substituting in this expression for x and y, their values as given by (VII.), the following formula will be the result:

$$\text{Cot. } \tfrac{1}{2}D' = \text{Cot. } nT \pm 2 \propto . \frac{\text{Sin. } T}{1 - \text{Cos. } 2nT}. \qquad \text{(XX.)}$$

The value of D′ being thus obtained, the required angle of intersection will be expressed by $2nT - D'$; as evidently appears from (V.)

Example 1. Let the modulus of curvature of the given curve be 30′, and let the given point be at the extremity of the 60th chain. Supposing the origin of the other curve to be placed 10 chains *back* upon the tangent line, what will be the new modulus of curvature, and what will be the angle of intersection at the given point?

In this case,

$$\text{Sin. } T' = \frac{.50000}{\frac{.50000}{.00873} + 20 \times .86603 + 200 \times .00873}$$

$$= \frac{.50000}{57.299 + 17.321 + 1.746} = \frac{.50000}{76.366} = .00655;$$

and consequently, T′ = 0° 22½′ = required modulus of curvature. And, Cot. ½D′ = 1.73205 $+ 20 \times \frac{.00873}{.50000}$ = 1.73205 + 20 × .01746 = 1.73205 + .34920 = 2.08125; and therefore, ½D′ = 25° 40′; or, D′ = 51° 20′. Hence, $2nT - D'$ = 60° − 51° 20′ = 8° 40′ =, the angle of intersection required.

Example 2. Let the modulus of curvature of the given curve be 2°, and let the given point be at the extremity of the 31st chain. Supposing the new curve to be commenced one chain in *advance* upon the tangent line, what will be the required modulus of curvature, and what will be the angle of intersection at the given point?

Here, T = 2°, and $n = 31$; and consequently $2nT = 124°$. Hence, in this case, Cos. $2nT$

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* *Note.*—By squaring each of the two formulas given by (VII.), and adding the two squares together, the following expression will result after a little reduction:

$$x^2 + y^2 = \frac{1 - \text{Cos. } 2nT}{2 \text{ Sin. }^2 T}$$

This is, however, not the form which a formula should have for computing the numerical value of $x^2 + y^2$; but it is useful in reducing other formulas.

becomes *negative*, while Sin. $2nT$ remains positive, agreeably to the principles of trigonometry. Also, in the present example, $\propto = -1$. Under those considerations, the formula (XIX.) gives,

$$\text{Sin. } T' = \frac{1 + \text{Cos. } 56^\circ}{\frac{1 + \text{Cos. } 56^\circ}{\text{Sin. } 2^\circ} - 2\,\text{Sin. } 56^\circ + 2\,\text{Sin. } 2^\circ}$$

$$= \frac{1.55919}{\frac{1.55919}{.03490} - 2 \times .82904 + 2 \times .03490} =$$

$$\frac{1.55919}{44.676 - 1.685 + .070} = \frac{1.55919}{42.788} = .03643\text{; or,}$$

$T' = 2^\circ\ 5\frac{1}{4}' =$ required modulus of curvature. In obtaining the value of the angle D′ by means of (XX.), the necessary sign of the trigonometrical quantities must in like manner be observed; and consequently, Cot. $\frac{1}{2}D' =$ Cot. 62°

$$- 2 \times \frac{\text{Sin } 2^\circ}{1 + \text{Cos. } 56^\circ} = .53171 - 2 \times \frac{.03490}{1.55919} =$$

$.53171 - 2 \times .02239 = .53171 - 04478 = .48693$; or $\frac{1}{2}D' = 64^\circ\ 2'$; and, $D' = 128^\circ\ 4'$. Hence, $D' - 2nT = 4^\circ\ 4'$, the angle of intersection required.

In computing the modulus of curvature for a long curve, which is required to be laid with precision, it will not be sufficient to obtain a result only true to the nearest *full minute*. For in tracing a curve agreeably to the principles given in Art. 3, it is evident that multiples of the modulus of curvature are required in laying the different chains; and consequently, an error of $\frac{1}{4}'$ in the modulus of curvature would produce an error of $2'$ in the angle of deflection, placing the 8th chain from the instrument. Now, in any common instrument, containing a good vernier scale, an angle of $2'$ is quite perceptible. Indeed, if the chains be 100 feet each, an angle of $2'$ will be subtended by a line nearly 6 inches long at a distance of 8 chains; and it follows, therefore, that an error of *one fourth part of a minute*, in the modulus of curvature, will, in such a case, produce an error of nearly 6 inches in the position of every 8th station from the instrument. And as the effects of this error will not continue to be only proportionably greater through the whole line, but will accumulate faster and faster, in a geometrical ratio, it is evident that an error of $\frac{1}{4}'$ in the modulus of curvature is an item of considerable consequence in laying long curves upon a graded surface.

21. If the point designated for the required curve to meet does not coincide with the extremity of the nth chain in the given curve, as in the last article it is supposed, but varies a small distance to the right or left, yet, *if the curves are long*, the best method will always be to compute the value of T′ as though the curve sought were intended to pass through the point contemplated in (XIX.); and then the requisite small variation in the computed value of T′, to meet the case proposed, may be subsequently determined by very simple methods, to be hereafter explained.

[From the Charleston Courier.]

LIFE'S LIKENESS.

Written in imitation of the poetry of the 17th century.

Life is—what?
It is the shooting of a star,
That gleams along the trackless air,
And vanishes, almost ere seen, to nought:
And such is man—
He shines and flutters for a span,
And is forgot.

Life is—what?
It is the vermeil of the rose,
That blooms but till the bleak wind blows,
Then all entombed, in sweets, doth fade and rot:
And such is man—
He starts in bravery for a span,
And is forgot.

Life is—what?
It is the dew drop of the morn,
That quiv'ring hangs upon the thorn,
'Till, quaff'd by sun-beams, 'tis no longer aught:
And such is man—
He's steel'd in for a span,
And melts, forgot.

Life is—what?
A stone, whose fall doth circles make
On the smooth surface of the lake,
Which spread till one and all forsake the spot:
And such is man—
'Midst friends he revels for a span,
And sinks, forgot.

Life is—what?
It is a bubble on the morn,
Rais'd by a *little globe* of rain,
Whose heir destroys the fabric it hath wrought:
And such is man—
Swell'd into being for a span.
And broke, forgot.

Life is—what?
A shadow on the mountain's side,
A rock that doth in either ride,
Driven by the northern gale, with tempest fraught:
And such is man—
He hangs on greatness for a span,
And is forgot.

Life is—what?
It is the sound of cannon near,
Which strikes upon the startled ear,
And ceases ere we can distinguish aught:
And such is man—
He frights and blusters for a span,
And is forgot.

Life is—what?
It is the swallow's sojournment,
Who, ere the summer's robe is rent,
Flies to some distant bourne, by instinct taught:
And such is man—
He rents his dwelling for a span,
And flits forgot.

And is this—life?
Oh yes! and had I time I'd tell
An hundred shapes more transient still—
But whilst I speak, Fate whets his slaughterous knife:
And such is man—
While reck'ning o'er life's little span,
Death ends the strife.

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